

Remarks

Claim 1 has been amended. Thus, claims 1-22 are pending in this application.

SUMMARY OF THE REJECTIONS, OBJECTIONS AND ALLOWED CLAIMS

In the Office action, claims 1, 2, and 7-12 were rejected under 35 U.S.C. § 102(e) as being anticipated by Nakamura (Pub. No. US 2003/0184235 A1). Claims 3-6 were objected to as being dependent upon a rejected base claim but would be allowed if rewritten in independent form. Claims 13-22 were allowed.

REJECTIONS BASED ON 35 U.S.C. § 102(e)

Claim 1 is a device for a wide area electron beam in which a neutral ion plasma is generated within a spatial volume between wire mesh electrodes. The ion plasma supplies ions to a cathode through wire mesh electrodes.

Nakamura is directed toward a plasma producing apparatus. Accordingly, the focus of Nakamura is an apparatus configured to produce the plasma itself (Nakamura paragraphs [0025] and [0047]). Claim 1, on the other hand, is directed toward an electron beam device configured to produce a uniform electron beam, wherein a plasma is merely one of a set of elements used to produce the uniform electron beam. Thus, these opposing objectives result in fundamentally different devices.

To further distinguish amended claim 1 from Nakamura, consider the behavior of the ion plasma within the spatial volume. It is important to note that ions are being accelerated **toward** the cathode and are actually **impacting** the cathode. An amendment has been made to claim 1 in order to clarify such a distinction from Nakamura. As recited in amended claim 1, the ions are:

"**impacting the cathode with sufficient force** to cause secondary electron emission having sufficient energy to traverse through the ion plasma toward the anode, thereby forming an electron beam extending over the anode."
(emphasis added)

This feature is described at page 4, lines 5-10 and page 6, line 30 to page 7, line 8 of the application. It is respectfully submitted that this feature is neither taught nor suggested by Nakamura.

In Nakamura, ions do not impact or impinge the cathode. Instead, electrons are emitted from a carbon nano tube, collide with material gas in the chamber and ionize the material gas, thereby producing the plasma (Nakamura paragraphs [0030] and [0047]). Nakamura teaches the use of **field emission** to force the emitted electrons into the material in the chamber (Nakamura paragraph [0029]). Nakamura goes further to state that if "the grid holes have a small diameter, ions and neutral molecules in the chamber are prevented from reaching the cathode electrode" (Nakamura paragraph [0030]).

In contrast, in claim 1 of the present invention, having ions reach the cathode is an important feature. The ions are not only configured to reach the cathode, the ions are configured to impact the cathode with force.

Claim 1 does **not** require field emission, as does Nakamura, to accelerate electrons into material. Rather, ionic collisions with the cathode force electrons to traverse back through the ion plasma.

Further, as indicated by paragraph [0049] and Figure 1 of Nakamura, ions are accelerated **away** from the cathode by the acceleration electrode [113]. The apparatus includes a "suppression electrode" which "catches and gathers scattering ions in order to increase the directivity of the ion flow" (Nakamura paragraph [0049]). The ions are led out linearly by

electrodes and are thrown to the substrate below (Nakamura paragraph [0050]).

In contrast, claim 1 of the present invention suggests that ions are being accelerated **toward** the cathode, wherein the subsequent collision produces an emission of electrons in the opposite direction of the acceleration. The distribution of electrons forming the electron beam adjacent to cathode surface is substantially the same as the distribution of ions impacting the cathode surface (page 8, lines 3-6). Accordingly, the device of claim 1 produces a uniform electron beam from an ionic collision with the cathode. Nakamura, on the other hand, teaches producing an ionic beam via collision of electrons with material gas in the chamber (Nakamura paragraph [0030]).

Accordingly, Nakamura does not teach or suggest all the elements claim 1 of the present invention. Thus, it is respectfully submitted that claim 1 is allowable.

Further, claim 1 is not suggested by any combination of the cited references, including Nakamura, Chaudhari (U.S. Pat. No. 5,770,826), Ito et al. (U.S. Pat. No. 4,641,031) and Sugawara et al. (U.S. Pat. No. 4,506,160). None of these references teach a device in which ions are configured to be accelerated toward a cathode surface, make impact and thereby produce an electron beam in the opposite direction of the acceleration. Thus, no combination of the cited references can suggest claim 1.

As to dependent claims 2-12, it is respectfully submitted these claims are allowable for at least the same reasons independent base claim 1 is allowable.

CONCLUSION

For the reasons set forth above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Accordingly, the issuance of a formal Notice of Allowance is solicited. The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

CERTIFICATE OF MAILING

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Respectfully submitted,

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